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Cover Page Footnote

We would like to thank Dr. Jud Heinrichs and his lab members, as well as the Penn State Dairy Barns, for the use of their data.

Association of Calf Growth and Feed Intake Traits with Mature Cow Milk Yield and Body Weight

A.S. Leaflet R2967

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Summary and Implications

Data from six different calf trials were compared to 134,469 daily milk records and 37,403 body weights to determine how heifer growth traits are associated with milk yield and mature cow body weight. Animals were classified into 3 categories (low, intermediate and high) according to their body weight, hip height, growth rate and starter feed intake. Calves that were classified in the intermediate body weight category tended to produce more milk during the first ten weeks of lactation than cows classified as having low or high body weights as calves. Additionally, cows classified in the low hip height group as calves produced less milk during the first ten weeks of lactation when compared to cows classified in the intermediate or high hip height category as calves. Calves classified in either the low growth rate or the low starter feed intake group tended to be lighter as mature cows when compared to the intermediate and high classifications of their respective categories. The results suggest that calf hip height and body weight can be useful predictors of milk yield, while calf growth rate and starter feed intake can impact mature cow body weight.

Introduction

Calf growth and development could impact mature cow traits such as milk yield and body weight, both of which are economically important in the dairy industry. Little is known about using calf measurements as predictors for mature cow traits mostly due to the minimal on-farm selection of replacement heifers. Several studies have measured the impact of calf growth rate on future milk yield, with conflicting results. This study compared calf growth data to milk yield and mature body weight records from the same individuals to determine how heifer development is associated with these traits.

Materials and Methods

Data were collected from six different calf trials of varying lengths conducted at Pennsylvania State University from 2003 to 2010. Calf hip height, starter feed intake, and

body weight were measured for periods that ranged from 4 to 8 weeks. Calves were divided into high, intermediate, and low ranking groups according to their hip height, starter feed intake, body weight and growth rate. The calf data from 197 Holstein heifers was merged separately with daily milk yield and mature body weight data obtained from AfiWeigh (Afimilk Ltd., Israel), a scale which records cow weight after milking. A total of 134,469 daily milk records and 37,403 mature body weight records were evaluated against the calf data using mixed model procedures (PROC MIXED, SAS Inst. Inc., Cary, NC). The model used to evaluate the daily milk records included age at calving group, treatment within trial, parity, lactation number, and calf groups as fixed effects and cow and calendar week by year as random effects. For the model used to evaluate the mature body weight records, lactation, days in milk, treatment within trial, calf groups, and lactation by days in milk were included as fixed effects while cow, cow by lactation, and calendar week by year were included as random effects. Average milk yields and mature body weights from the high, medium, and low groups of the hip height, starter feed intake, body weight, and growth rate categories were obtained and evaluated for differences.

Results and Discussion

Heifer body weights were associated with milk yield later in life as cows. As shown by Figure 1(b), during lactation weeks 1 to 5, cows from the intermediate weight classification as calves produced approximately 5.0 kg more milk than cows from the light weight classification as calves and 5.6 kg more milk than cows from the heavy weight classification as calves. During weeks 6 to 10 of lactation, they also produced approximately 3.8 kg and 4.6 kg of milk more than cows from the light and heavy weight classifications as calves, respectively. No milk yield differences were observed between heifer body weight classifications during lactation weeks 10 to 20.

There was a relationship between hip height in heifers and their subsequent milk yield. As shown by Figure 1(a), in weeks 1 to 5 of lactation, cows from the low hip height calf groups tended to produce 4.2 kg and 6.0 kg milk less than cows from the intermediate and high hip height classifications as calves, respectively. They also produced approximately 4.2 kg of milk less when compared to cows from the high hip height classification as calves during weeks 1 to 6 of lactation. However, during weeks 10 to 20 of lactation, no differences in milk yield between heifer hip height classifications were detected.

Heifer calf growth rate and starter feed intake were related with mature body weight as cows. Figure 2 shows

that cows from the low growth rate classification as calves had lighter mature body weights than cows from the intermediate and high growth rate calf groups by approximately 45.3 kg and 52.7 kg, respectively. Similarly, cows from the low starter feed intake calf group weighed lighter as mature cows than cows from the intermediate and high starter intake classifications as calves by approximately 47 kg.

In conclusion, calf body weight and hip height could be useful indicators to predict subsequent cow milk

yield. Higher calf growth rate and starter feed intake could have an effect on mature cow body weights.

Acknowledgements

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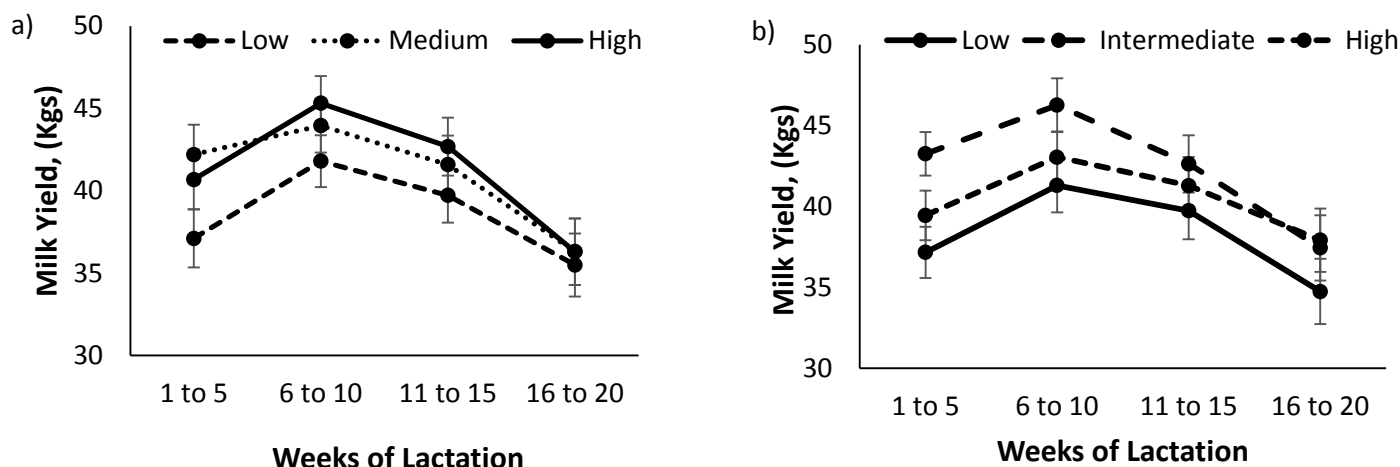


Figure 1. Average milk yield in kg (LS means \pm SE) for high, intermediate and low a) hip height calf groups by weeks of lactation and b) body weight calf groups by weeks of lactation.

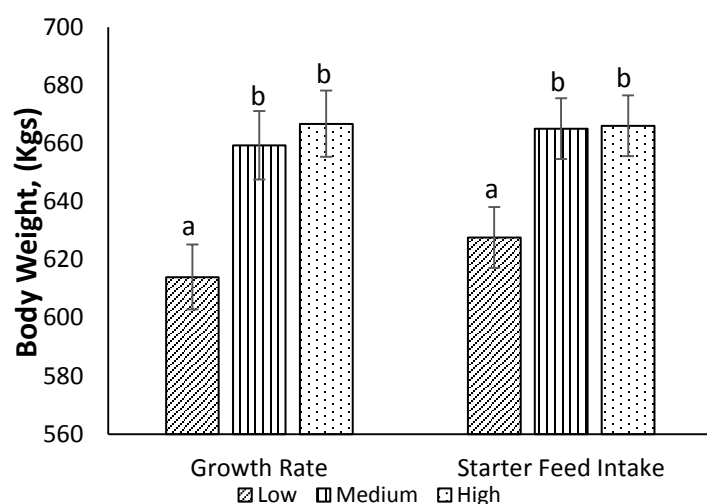


Figure 2. Body weight by low, intermediate and high calf groups for growth rate and starter feed intake. ^{a, b} Significant differences ($P < 0.05$) between group classifications.